

CLAIMS

What is claimed is:

1        1. A fiber optic module comprising:  
2        a pull-actuator to disengage and withdraw the fiber optic  
3        module from a cage assembly; and  
4        one or more electro-optic transducers to convert optical  
5        signals into electrical signals or electrical signals into  
6        optical signals.

202  
21

2        2. The fiber optic module of claim 1 wherein  
3        the fiber optic module is a small form pluggable (SFP)  
4        fiber optic module and the cage assembly is a small form  
5        pluggable (SFP) cage assembly.

1        3. The fiber optic module of claim 1 wherein  
2        the pull-actuator is activated to disengage and withdraw  
3        the fiber optic module by a single backward pull action.

1        4. The fiber optic module of claim 1 wherein  
2        the pull-actuator includes one or more grooves to  
3        slideably engage the fiber optic module.

1        5. The fiber optic module of claim 1 wherein  
2        the fiber optic module includes one or more grooves to  
3        slideably engage the pull-actuator.

1        6. The fiber optic module of claim 1 wherein  
2        the pull-actuator slides to disengage the fiber optic  
3        module from the cage assembly.

TOP SECRET

1        8.    The fiber optic module of claim 1 wherein  
2        the pull-actuator includes  
3            one or more end-stops to prevent the pull-actuator  
4        from becoming disengaged from the fiber optic module as it is  
5        pulled.

9. The fiber optic module of claim 1 wherein  
the pull-actuator includes  
a pull-tab,  
a shaft coupled to the pull tab at a first end, and  
an opening at a second end of the shaft to engage a  
first end of a pivot arm.

1        10. The fiber optic module of claim 1 wherein the pull-  
2        actuator includes  
3                an orientation indicator to indicate the fiber optic  
4        module which the pull-actuator releases.

1           11. The fiber optic module of claim 1 wherein  
2           the pull-actuator is formed of metal.

1        12. The fiber optic module of claim 1 wherein  
2        the pull-actuator is formed of a plastic.

1           13. The fiber optic module of claim 1 further  
2 comprising:

1        19. The fiber optic module of claim 15 wherein  
2        the second engaging end includes a latch to engage the  
3        pivot-arm actuator to the pull-actuator.

1           21. The fiber optic module of claim 13 further  
2 comprising:  
3           a spring to cause the pivot-arm actuator to return to its  
4 initial position when the pulling force on the pull-actuator  
5 is removed.

23. The fiber optic module of claim 21 wherein  
the spring causes the pull-actuator to return to its  
initial position when the pulling force on the pull-actuator  
is removed.

25. The fiber optic module of claim 24 wherein with the belly-to-belly configuration, two pull actuators are located in proximity to each other along a common surface between two fiber optic modules.

Exp. Mail No.: EL802887585US

```
3      a\\pull-tab;
```

1        27. The pull-actuator of claim 26 wherein  
2        the pull-actuator slides to cause the second actuator to  
3        disengage a fiber optic module from a cage assembly.

1        29. The pull-actuator of claim 26 wherein  
2        the pull-actuator includes one or more grooves to  
3        slideably engage a fiber optic module.

1           31. The pull-actuator of claim 26 wherein  
2           the pull-actuator includes  
3           one or more end-stops to prevent the pull-actuator  
4           from becoming disengaged from a fiber optic module as it is  
5           pulled.

1           32. The pull-actuator of claim 26 wherein the pull-tab  
2 includes an orientation indicator to indicate a fiber optic  
3 module which the pull-actuator releases.

1 33. The pull-actuator of claim 26 wherein the second  
2 actuator is a pivot-arm actuator which pivots to disengage a  
3 fiber optic module from a cage assembly when the pull-actuator  
4 is pulled.

1 34. The pull-actuator of claim 26 wherein the pull-  
2 actuator permits arranging multiple fiber optic modules in a  
3 belly-to-belly configuration without obstructing adjacent  
4 pull-actuators.

1 35. The pull-actuator of claim 34 wherein with the  
2 belly-to-belly configuration, two pull-actuators are located  
3 in proximity to each other along a common surface between two  
4 fiber optic modules.

1 36. A pivot-arm actuator for fiber optic modules having  
2 one or more electro-optic transducers, the pivot-arm actuator  
3 comprising:

4 a pivot arm which causes a fiber optic module to be  
5 released from a cage assembly when a pull-actuator is pulled;  
6 and

7 a pivoting pin to rotationally couple the pivot arm to a  
8 fiber optic module.

1 37. The pivot-arm actuator of claim 36 wherein the pivot  
2 arm includes,

3 a first engaging end with a keeper to engage a fiber  
4 optic module to a cage assembly.

1 38. The pivot-arm actuator of claim 36 wherein the pivot  
2 arm includes,

09929413-08301



1 44. The pull de-latch mechanism of claim 41 wherein  
2 the pull-actuator includes  
3 an orientation indicator to indicate the fiber optic  
4 module which the pull-actuator releases.

1        46. The pull de-latch mechanism of claim 41 wherein  
2        the pull-actuator includes  
3        one or more end-stops to withdraw the fiber optic  
4        module as the pull-actuator is pulled.

48. The pull de-latch mechanism of claim 41 wherein the pull de-latch mechanism permits arranging multiple fiber optic modules in a belly-to-belly configuration without obstructing adjacent pull de-latch mechanism.

Exp. Mail No.: EL802887585US



1 50. A fiber optic module comprising:  
 2 means for converting optical signals into electrical  
 3 signals or electrical signals into optical signals; and  
 4 means for disengaging the fiber optic module from a cage  
 5 assembly by pulling a pull-actuator.

1 51. The fiber optic module of claim 50 further  
 2 comprising:  
 3 means for slideably engaging the means for disengaging  
 4 the fiber optic module:

1 52. The fiber optic module of claim 50 wherein the means  
 2 for disengaging also provides a means for withdrawing.

1 53. The fiber optic module of claim 50 further  
 2 comprising:  
 3 means for withdrawing the fiber optic module.

1 54. The fiber optic module of claim 50 further  
 2 comprising:  
 3 means for pivotally disengaging the fiber optic module  
 4 from a cage assembly when the pull-actuator is pulled.

1 55. The fiber optic module of claim 54 further  
 2 comprising:  
 3 means for coupling the pivotally disengaging means to the  
 4 fiber optic module.

1 56. The fiber optic module of claim 50 further  
 2 comprising:  
 3 means for indicating the fiber optic module which the

095413-03650

4 means for disengaging releases.

1 57. A method for disengaging and withdrawing a fiber  
2 optic module from a cage assembly comprising:  
3 pulling a pull-actuator to disengage the fiber optic  
4 module from the cage assembly; and  
5 continuing to pull on the pull-actuator to withdraw the  
6 fiber optic module from the cage assembly.

1 58. The method of claim 57 comprising:  
2 releasing the pull-actuator if the fiber optic module has  
3 been released from the cage assembly.

1 59. A fiber optic module comprising:  
2 a nose receptacle including  
3 a fiber optic cable receptacle to receive one or  
4 more fiber optic cable plugs,  
5 a pull-actuator to release the fiber optic module  
6 from a cage assembly using a pull action;  
7 a pivot-arm actuator coupled to the pull-actuator,  
8 the pivot-arm actuator to pivot and release a keeper from a  
9 latch to release the fiber optic module in response to a pull  
10 action on the pull-actuator; and  
11 a printed circuit board including one or more  
12 electro-optic transducers to convert optical signals into  
13 electrical signals or electrical signals into optical signals.

1 60. The fiber optic module of claim 59 wherein,  
2 the fiber optic module is a small form pluggable (SFP)  
3 fiber optic module and the cage assembly is a small form  
4 pluggable (SFP) cage assembly.

1 61. The fiber optic module of claim 59 further

3 a housing to couple to the nose receptacle and cover the  
4 printed circuit board.

63. The fiber optic module of claim 59 wherein,  
the pull-actuator includes one or more grooves to  
slideably engage the nose receptacle.

1           65. The fiber optic module of claim 59 wherein,  
2           the pivot-arm-actuator includes  
3           a pivot pin rotationally coupled to the nose receptacle  
4           at first and second ends to allow the pivot-arm actuator to  
5           pivot.

66. The fiber optic module of claim 59 wherein  
the nose receptacle further includes  
a spring coupled to the pivot-arm-actuator at a first end  
and the nose receptacle at a second end, the spring to exert a  
force on the pivot-arm-actuator to exert a return force on the  
pull-actuator.

1        67. The fiber optic module of claim 59 wherein,  
2        the pull-actuator includes  
3        an orientation indicator to indicate the fiber optic

4 module which the pull-actuator releases.

1 68. The fiber optic module of claim 59 wherein,  
2 the pull-actuator includes  
3 a pull-tab,  
4 a shaft coupled to the pull-tab at a first end, and  
5 a catch at a second end of the shaft.

1 69. The fiber optic module of claim 59 wherein,  
2 the pull-actuator is located at a bottom side of the  
3 fiber optic module.

1 70. The fiber optic module of claim 59 wherein,  
2 the nose receptacle further includes  
3 a grip to pull out on the fiber optic module.

1 71. A configuration of fiber optic modules having one or  
2 more electro-optic transducers, the configuration comprising:  
3 a printed circuit board having a first side and a second  
4 side;  
5 a first cage coupled to the first side of the printed  
6 circuit board to receive a first fiber optic module; and  
7 a second cage coupled to the second side of the printed  
8 circuit board to receive a second fiber optic module, the  
9 second cage aligned in parallel to the first cage such that a  
10 first belly of the first fiber optic module is adjacent a  
11 second belly of the second fiber optic module.

1 72. The configuration of claim 71 wherein,  
2 the first belly of the first fiber optic module being  
3 adjacent to the second belly of the second fiber optic module  
4 provides for increased density.

099440660

1 73. The configuration of claim 71, further comprising:  
 2 the first fiber optic module having a first pull-actuator  
 3 with a first orientation indicator;  
 4 the second fiber optic module having a second pull-  
 5 actuator with a second orientation indicator; and  
 6 the first pull-actuator and the second pull-actuator each  
 7 having a pull-tab offset from each other when the first belly  
 8 is adjacent the second belly.

1 74. The configuration of claim 73 wherein,  
 2 the first orientation indicator indicates the first fiber  
 3 optic module and the second orientation indicator indicates  
 4 the second fiber optic module.

1 75. The configuration of claim 73 wherein,  
 2 the pull-tab is a pull button.

1 76. The configuration of claim 73 wherein,  
 2 the pull-tab is a pull knob.

1 77. The configuration of claim 73 wherein,  
 2 the pull-tab is a pull hook.

1 78. The configuration of claim 73 wherein,  
 2 the pull-tab is a pull ring.

1 79. The configuration of claim 73 wherein,  
 2 the pull-tab is a pull square.

1 80. The configuration of claim 73 wherein,  
 2 the pull-tab is a pull mechanism.

00039413-082301